# M.Sc. Previous Botany

There shall be Five theory papers and two practical examination as follows:

| | |
|---|---|
| Paper I: Viruses, Bacteria Fungi and Lichens | M. M.: 80 |
| Paper II: Algae and Bryophytes | M. M.: 80 |
| Paper III: Pteridophytes, Gymnosperms and Palaeobotany | M. M.: 80 |
| Paper IV: Ecology, Soil Science and Phytogeography | M. M.: 80 |
| Paper V: Cytology, Genetics and Biostatistics | M. M.: 80 |
| Practical: Day I-Based on papers I - III | M. M.: 120 |
| Practical: Day II-Based on papers IV - V | M. M.: 80 |
| **TOTAL** | **600 MARKS** |

## Paper-I VIRUSES, BACTERIA FUNGI AND LICHENS

### Section A-Fungi

Status of fungi, principles of important systems of classification of fungi upto the rank of classes, Detailed study of the classification of Alexopoulos and Mims 1970

A study of the Myxomycetes, Plasmodiophoromycetes, Phycomycetes, Oomycetes, Zygomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes with reference to:

a. Classification upto the rank of order.

b. Range of structure and organisation of vegetative and reproductive bodies.

c. Ultra structure of fungal cells.

d. Method of reproduction.

e. Variations in life-cycle.

Modes of nutrition of fungi and their physical and chemical requirement for growth and reproduction,

Heterokaryosis, Parasexuality, Heterothallism, Variation in fungi, Hormonal control of sexual reproduction

Economic importance of fungi:

a. Utilization of fungi by man as food, in food processing, in production of organic acid, alcohols, antibiotics, vitamins and enzyme.

b. Harmful activities, Deterioration of materials by fungi, Fungi as agents of Plant and Human diseases.

c. Role of Fungi in environmental maintenance, methods of isolation and culturing of fungi.

### Section B- Lichens

A general account of lichens and its symbionts, thallus structure, physiology, reproduction, classification and chemistry of lichens, isolation of symbionts, synthesis of food and economic importance

### Section C-Viruses

Nature of plant viruses and symptoms caused by them, microscopic, histological and cytological, Transmission of plant viruses, their relationship with vectors

Physiology of virus infected plants; serology and its applications.

Isolation, purification, morphology and structural components of viruses

Replication, movement and virus related organisms (mycoplasma)

Nomenclature, classification and control measures

Phages: Structures, mode of infection and multiplication in their hosts.

### Section D-Bacteria

Classification, a general account of their mode of nutrition, cytology, reproduction, general importance of bacteria

Economic importance and industrial uses of bacteria

## Paper-II ALGAE AND BRYOPHYTES

### Section A-Algae

Principles of important systems of classification of algae to the rank of classes

Occurrence and distribution

Range of the organisation

Algal pigments, its significance in classification

Algal reproduction and life cycles

Economic and environmental aspects of algae

Study of the following classes:

a. Cyanophyceae (Blue-green algae): Occurrence and habitat, cellular organisation, reproduction, classification up to the rank of order, phylogeny, brief knowledge of the following genera :

*Chroococcus, Gloeotrichia, Nostoc, Cylindrospermum, Stigonema***.**

b. Chlorophyceae (green algae): General features, range of vegetative structure, reproduction, classification upto the order, phylogeny, brief knowledge of the following genera:

*Chlorella, Hydrodictyon, Enteromorpha, Sphaeroplea, Cladophora, Stigeoclonium, Draparnaldiopsis, Cephaleuros, Fritschiella, Trentepohlia, Acetabularia, Valonia, Caulerpa, Closterium, Zygnema, Mougeotia and Nitella.*

c. Phaeophyceae (Brown Algae): General features, range of vegetative structure, reproduction, classification upto the order, brief knowledge of the following genera:

*Pylatella, Dictyota, Laminaria, Fucus*

d. Rhodophyceae (Red Algae): External features, life histories, classification upto the rank of orders, brief knowledge of the following genera:

*Porphyra, Nemalion, Gelidium Polysiphonia*

e. Xanthophyceae: General features, brief knowledge of the following genera :

*Botrydium, Vaucheria*

f. Bacillariophyceae: General features, brief knowledge of the following genera :

*Peridinium, Ceratium*

### Section B-Bryophytes

Origin and evolution of bryophytes

Classification and geographical distribution of bryophytes with special reference to India,

Bryophytes and environmental pollution, their economic importance,

A comparative study of morphology, anatomy, physiology, life history, classification and phylogeny of the following groups with special reference to India, Hepaticopsida, Anthocerotopsida, Bryopsida

Fossil History of Bryophytes

## Paper-III PTERIDOPHYTES, GYMNOSPERMS AND PALAEBOTANY

### Section A-Pteridophytes

Classification and origin of pteridophytes,

The vegetative sporophytes: Microphylls stelar theory, telome theory.

The fertile sporophytes: sporangia position ontogeny, types and structure. Sorus evolution in ferns, Heterospory- occurrence and significance

The gametophyte: General organography of pteridophyte gametophyte, physiology of germination of fern spore development of fern prothallus.

Embryogeny: General organography of pteridophyte embryos.

Characteristic features of Rhyniaceae, Psilotaceae, Pleuromiaceae, Lepidodendraceae, Sphenophyllaceae, Calamitaceae, Protopteridaceae, Ophioglossaceae, Gleicheniaceae, Azollaceae.

Distribution of ferns, ecology of pteridophytes, apogamy, apospory

**Section B-Gymnosperms**

Classification distribution and economic importance of gymnosperms with special reference to India
General accounts of the structure and reproduction of the following taxa:

a. Pteridospermae
b. Glossopteridales
c. Cycadales with special reference to *Zamia*
d. Bennetitales with special reference to *Williamsonia, Cycadeoidea*.
e. Pentoxylae
f. Cordaitales
g. Ginkgoales-with special reference to Ginkgo.
h. Coniferae with special reference to *Lebachia, Abies, Araucaria, Cryptomeria, Cupressus, Thuja* and *Cephalotaxus*.
i. Taxales with special reference to *Ephedra*
j. Ephedrales with special reference to *Gnetum*

Origin and evolutionary tendencies in Gymnosperms

**Section C-Palaeobotany**

Types of fossils and methods of study
Applied palaeobotany; carbon dating, palaeobotany of coal and petroleum, palynology.

Study of Indian fossil flora, Gondawana flora, the Rajmahal flora, Deccan Intertrappean flora and other Indian tertiary flora

Theory of continental drift

## Paper-IV ECOLOGY, SOIL SCIENCE AND PHYTO-GEOGRAPHY

**Section A-Ecology**

Ecology, its scope and approach of study
The environment, interaction of factors and ecological niche

Autecological studies with emphasis on Indian work

Phytosociology analytic and synthetic characters of vegetation

Life-forms and biological spectrum

Plant communities, dynamics and development succession and climax; methods of study and classification of plant communities

Ecological adaptation and plant indicators

Population ecology and gene ecology

Ecosystem concept and idea of major ecosystems

Ecosystem functioning: Ecological energetics, production ecology, measurement of primary productivity, principles of biogeochemical cycles

Ecological environment and pollution

**Section B-Soil Science**

Soil: Its origin and development

Processes of soil formations and soil profile

Soil properties in relation to plant growth

a. Physical; texture, structure, density, porosity, permeability to air, water and roots

b. Soil-water; energy concept of soil- water, soil water quantities and their measurement

c. Biological; soil organisms, their role in plant soil relationship.

d. Soil classification; Outlines of different system of soil classification, soil types of India with special reference to U.P.

4. Soil erosion and conservation; causes of soil erosion and its effects on environment, methods of soil conservation and their impact on vegetation and environment

**Section C-Phytogeography**

Plant Geography: Distribution patterns, barriers, endemic age- area hypothesis

Vegetational and floristic region of India

## Paper-V CYTOGENETICS & BIOSTATISTICS

**Section A-Cytogenetics**

Cell division, Cell Cycle, chromosome pairing mechanism and synaptonemal complex

Cytoskeleton and chromosome movements, structure function and assembly of microtubules, basal bodies and centrioles, spindle organisation movements of chromosomes

Special Chromosomes

Numerical variation in chromosomes, Euploidy and aneuploidy significance of polyploidy in relation to crop improvement

Modifications of Mendel's Laws of inheritance, Interaction of genes and quantitative inheritance

Linkage crossing-over and chromosome map

Population, genetics, gene pools and gene frequency

Inbreeding and out breeding hybrid vigour and its Significance.

Mutation and mutagens

Genetics of mico-organism (Bacteria, *Neurospora*, Virus)

Recombinant DNA techniques and its application in genetic engineering

Tissue culture and somatic hybridization

**Section B-Biostatistics**

Measure of dispersion; mean deviation, variation, standard deviation and error

Test of significance.

a. T-Test: paired and unpaired sample

b. $\chi^2$ Test: goodness of fit, test of Independence, test of heterogeneity.

c. F-Test: Variance ratio of two populations, analysis of variance (mono and bivariant)

d. Regression and correlation.

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# M.Sc. Final Botany

There shall be Five theory papers and two practical examinations as follows:

| | |
|---|---|
| Paper I: Plant Physiology and Biochemistry | M. M.: 80 |
| Paper II: Angiosperm taxonomy, Economic Botany and Morphology | M. M.: 80 |
| Paper III: Anatomy, Embryology and Morphogenesis | M. M.: 80 |
| Paper IV: Microbiology, Progress of Botany and Microtechnique | M. M.: 80 |
| Practical: General-Based on papers I - IV | M. M.: 150 |
| **Paper V: Special Papers (Only one paper to be selected)** | **M. M.: 80** |
| Paper V(A): Plant Pathology | |
| Paper V(B): Plant Physiology (Metabolism and Growth) | |
| Paper V(C): Forest Ecology (Where forest are available to study) | |
| Paper V(D): Cytogenetics and Plant Breeding of crops | |
| Paper V(E): Environmental Botany | |
| **Practical: Special Paper - Based on Papers V** | **M. M.: 50** |
| **TOTAL** | **600 MARKS** |

## M.Sc. (Final) Paper-I PLANT PHYSIOLOGY AND BIOCHEMISTRY

**Section A-Plant Physiology**

Water relations, absorption, transpiration of water, osmotic quantities and hydrodynamics of plant cell

Mineral metabolism essential and beneficial nutrients, availability, deficiency and toxicity; their role in plant metabolism, their absorption and translocations

Plant membranes – their structure and function

Photosynthes: Chloroplast, $CO_2$ reduction cycle in green plants. Hill reaction, Photophosphorylation chemosynthesis and bacterial photosynthesis

Translocation of organic solute including experimental evidences

Respiration: Mitochondrial, Anaerobic respiration, fermentation aerobic respiration, respiration in succulants, photorespiration, respiratory enzyme, oxidative phosphorylation electron transport

Fat metabolism: $\alpha$-oxidations and $\beta$-oxidations, mechanism of fat synthesis and degradation.

Physiology of dormancy, senescence, seed germination and fruit ripening

**Section-B Biochemistry**

Methods of Biochemistry Analysis:

a. Chromatography
b. Colorimetry
c. Spectrophotometry
d. Tracer technique

Introduction to Bioenergetics

a. Laws of thermodynamics and concept of entropy
b. Chemical equilibrium and chemical energetic
c. Energetic coupling and energy rich compounds
d. Dynamic equilibrium and steady state
e. Redox system and redox potential
f. Measurement of energies.

Enzymes:

a. Chemical nature of enzymes.
b. Modern nomenclature and modern classification of enzymes
c. Mechanism of enzyme action and Michaelis concept

d. Factors affecting enzyme reactions
e. Structure and function of co-enzymes and prosthetic groups.

Classification and Biochemistry of Carbohydrates

Amino Acids and Proteins:

a. Amino acids and their synthesis.
b. Biosynthesis and degradation of nucleotides and proteins and their properties.
c. Primary secondary and tertiary structures of proteins and properties.
d. Denaturation, degradation and renaturation of proteins and nucleic acids.

**Note:** ***2 Questions from each Section are necessary***

## Paper-II ANGIOSPERMS-TAXONOMY, ECONOMIC BOTANY AND MORPHOLOGY

### Section-A Taxonomy

History of plant taxonomy

Systems of classification: History, outlines of basic importance and shortcomings of following classifications.

a. Bentham and Hooker ..... (in detail)
b. Hutchinson
c. Takhtajan
d. Conquist

Rules of Botanical Nomenclature.

Field and herbarium techniques, Herbaria and Botanical Gardens of India and World, Organisation and activities of Botanical survey of India (BSI)

General knowledge of the distinguishing features of the following families with special reference to best flora :

a. Dicotyledones, Ranunculaceae, Magnoliaceae, Nymphaeaceae, Annoniaceae, Caryophyllaceae, Capparidaceae, Tamaricaceae, Mimosaceae, Lythraceae, Onagraceae, Rubiaceae, Asteraceae, Primulaceae, Sapotaceae, Oleaceae, Salvadoraceae, Asclepiadaceae, Boraginaceae, Scrophulariaceae, Lentibulariaceae, Bignoniaceae, Convolvulaceae Pedaliaceae, Acanthaceae, Verbenaceae, Labiateae, Polygonaceae, Nyctaginaceae, Loranthaceae, Euphorbiaceae, Moraceae, and Caricaceae.

b. Monocotyledons: Hydrocharitaceae, Orchidaceae, Musaceae, Amaryllidaceae, Palmae, Commelinaceae, Lemnaceae, Alismaceae, Cyperaceae.

**Section B-Economic Botany**

Scope of economic botany, study of economically important plants and plant products

Forest Products

(a) Wood Timber and Lumber
(b) Resins, gum, tanning materials and cork
(c) Rubber and other latex products

Textile plants and products: A general account

Fumitories and masticatories: A general account

Narcotics and Insecticide as plant products

**Section C-Morphology**

Phylogeny and interrelationship of Angiosperms

Morphology of flower with special reference to the morphology of carpel and inferior ovary

## Paper-III ANATOMY, EMBRYOLOGY AND MORPHOGENESIS

**Section-A Anatomy**

The cambium, its derivative tissues, differentiation of secondary phloem and xylem

Structure of woods in relation to its weight, strength, durability and taxonomic significance

Anomalous secondary growth in roots and stems

Cork cambium and its derivatives, function of cork, commercial cork and its uses. abscission layers

Origin of lateral and adventitious roots, root-stem transition

Anatomy in relation to taxonomy

**Section-B Embryology**

Male and female gametophytes

Fertilization and its control with special reference to incompatibility in flowering plants

Endosperm and its abnormalities, Embryo developments

Apomixis, Polyembryony and its induction

Induced parthenocarpy, Embryology in relation to Taxonomy

(Development details of different types of embryosacs, microsporangia, endosperms should be confined to important types).

**Section-C Morphogenesis**

Polarity, polarity in isolated cells, plasmodia and coenocytes, Expression of polarity in external and internal structure of plants; Physiological manifestations of polarity: Role of polarity in developmental pattern

Correlation: Physiological and genetical correlations

Symmetry: Inorganic and organic symmetries, radial, bilateral and dorsiventral symmetries in plant body; Development of symmetry

Experimental morphology: methods and data related to organo genetic activities of shoot-apex; morphogenesis in *Acetabularia*.

## Paper-IV MICROBIOLOGY, PROGRESS OF BOTANY AND MICROTECHNIQUE

**Section-A Microbiology (Applied)**

Soil Microbiology: Decomposition of organic matter in soil, cycling of essential elements in nature, biofertilisers

Microorganism in food processing: Cheese, butter, milk, bread

Microorganisms in relation to biotechnology

a. Production of alcohol, beverages, organic acids , vitamins, antibiotics and enzymes

b. Role of micro-organisms in sewage disposal and alternative source of energy.

c. Micro-organism and maintenance of environment

**Section-B Progress of Botany**

Progress of Botany in India

Research organisations, Gardens and Herbaria of India

Important Botanical Societies and Journals of India

**Section-C Microtechnique**

Theory of fixation and important fixatives, storage of fixed materials

Killing, Fixation, embedding and section cutting in serial, rocking and rotary microtomes

Stansand Dyes: Haematoxylin, safranin, fast-green and carmine

Principle of light microscopy, resolution and magnification, use of camera lucida, research microscope,

phase contrast and electron microscope (Principles)

Use of pH meter, oven, Incubator and autoclave

Preparation of culture media viz PDA, Vogel's and White's medium, Maintenance of cultures.

## Paper-V(A) PLANT PATHOLOGY

**Section-A General Principles**

Concept and importance of plant diseases

Symptoms of plant diseases caused by fungi, bacterial and viruses

Mode of infections and development of pathogen in plants

Enzymes and toxins in plant diseases

Mechanism of defence in plants: Morphological and biochemical defence mechanism, disease resistance.

Variability in plant pathogens: Types of variations, mechanism of variability.

Effect of environment on development of infectious diseases of plants: epidemiology, plant disease forecasting.

Transmission of plant disease

Methods of study of disease of plant, isolation of pathogens and tests of pathogenecity

Principles and method of plant disease control: regulatory methods, cultural and biological methods, physical means, chemical methods (fungicides chemotherapy), resistant varieties.

**Section-B Plant Diseases**

Study of important symptoms, causal organism, disease cycle and control of the following disease of crop plants in U.P. caused by fungi, bacteria, viruses and M.L.O.

a. Rots: Fruit and stem rot of papaya, fruit rot and die-back of chillies, rhizome rot of ginger and red rot of sugar cane.

b. Damping of seedling of crop plants.

c. Downy mildew of bajra, crucifers, pea and cucurbits.

d. Powdery mildew of barley, wheat, pea, apple and cucurbits.

e. Rusts of wheat, *Cicer* (Gram), barley and linseed.

f. Smuts and Bunts: Covered and loose smuts of barley and wheat; smuts of maize, sorghum and sugarcane; loose smut of rice and bunt of rice.

g. Wilt of arahar, cotton, gram and sugarcane.

h. Leaf spots, blights and necrosis; leaf spot of crucifers, rice and turmeric; Tikka disease of ground nut, early and late blight of potato; leaf blight of wheat; blast disease of rice, mango abnormalities.

h. Galls and other abnormalities stem, galls of coriander, ergot of bajra, leaf curl of peach and apple.

**Bacterial Disease**

Citrus cankers, blight of cotton, angular leaf spot, black and scattering blight; blight of rice, brown rot of potato, red stripe of sugarcane, tundu diseases of wheat.

**Virus Disease**

Mosaics of apple, cucurbits, sugarcane, papaya, potato (Potato virus A, X,Y) and tobacco vein mosaic of bhindi, Yellow mosaic of legumes.

Leaf curl of chillies, papaya, tobacco and tomato; leaf roll of potato bunchy top of banana, tristeza of citrus; tug of rice

Disease cuased by M.L.O.: Little leaf of brinjal, curling of citrus, purple top of potato, sesame phyllody, grassy shoot of sugarcane.

**Note :** ***2 Question from section A and 2 from Section B are necessary.***

**Paper-V (B) ADVANCED PLANT PHYSIOLOGY**

**Section-A Plant Metabolism**

Photosynthesis and chemosythesis, Quantasomes, biosynthesis of chlorophylls, conversion of solar energy into chemical energy and its utilization in $CO_2$ reduction cycles, Efficient and inefficient plants, bacterial photosynthesis and its utility in nature.

Organic acid metabolism, succulent, CAM pathway and their significance

Plant Energetic as controlled by Photosynthesis, Respiration and Photorespiration

Respiration: Biological oxidations of carbohydrates and inter conversions of the products, terminal oxidation electron transport, role of cytochromes and other heme compounds.

Nitrogen Metabolism: Synthesis and activation of amino acids, transcription and translations, genetic code the template, chemical regulation and biosynthesis of proteins and enzymes, Biochemistry of biological nitrogen fixation and its significance.

Phosphorus metabolism, Metabolism of phosphorylated compounds and their role

Lipid Metabolism: Classification of fat and fatty acids, biosynthesis and breakdown of fat and lipids, its significance, Unsaturated fatty acids.

Secondary plant products and their biosynthesis

**Section-B Growth**

Growth analysis and control mechanism, biological clocks

Germination of photo and non-photoblastic seeds; physiology of seed and dormancy

Factors affecting growth and plant growth under different stresses, role of phytochrome and mechanism of its action in growth, morphogenesis and differentiation

Physiology of abscission; biosynthesis of auxins; gibberellins and cytokinins and their mechanism of action

Physiology of flower initiation and floral expression

Physiology and biosynthesis of alkaloids, vitamins and sterols

**Note:** ***At least 2 question from section A and one from section B are necessary***

## Paper-V (C) FOREST ECOLOGY

**Section-A: General**

An outline of forest ecosystem

Phytosociological concepts and methods for studying forest vegetation

General ecological features of the main forest types of India

Ecology of some important timber tree like teak, sal and deodar

Regeneration of forests

Factors destructive to forest ecosystem

Applied forest ecology

Importance of forests in maintenance of environment

**Section-B: Forest Soils and micro-environment**

Soil development in forests

Physico-chemical properties of forest soils

Forest litter, humus formation and classification of humus

Forest and grassland soils

Soil in relation to forest vegetation

Micro-environment of the forest

Ecological, economical and biological importance of forests

**Note :** ***2 Question from each section are necessary***

## Paper-V(D) CYTOGENETICS AND PLANT BREEDING OF CROPS

### Section-A Cytogenetics

Cytology: Cell structure, cell division, structure of chromosomes, nucleosomes concept, sex chromosomes, B chromosomes, special chromosomes

Genetics: Mendelism, chromosome theory of heredity, linkage, crossing over and gene mapping, Interaction of gene, Quantitative inheritance, cytoplasmic inheritance, sex linked inheritance, chromosomal aberration, numerical changes in chromosomes- euploidy (haploidy and polyploidy) aneuploidy and their role in plant crop improvement.

Molecular Biology and microbial genetics: Gene concept, cistron, muton, recon, DNA as genetic material, structure of DNA, protein synthesis, genetics of fungi, bacteria and viruses.

### Section-B Plant Breeding

Principles and concept of plant breeding; techniques of plant breeding, selection, hybridization, acclimatization, heterosis, sterility and incompatibility, chimera and graft hybrids, breeding for disease, insect and drought resistance, crop improvement and methods of breeding of wheat maize, paddy, sugarcane, arhar, potato and cotton with special reference to work done in India

In-vitro techniques in relation to plant breeding classification, meristem culture, anther and pollen culture, tissue and cell culture, cybrids, protoplast fusion, hybridomas achievements and prospects

Biometry and experimental designs : Importance of biometry in plant breeding data representation, classification tabulation, frequency, Null hypothesis, chi-square test (Numericals in relation to the genetics and plant breeding) correlation and regression in relation to plant breeding) Experimental designs

## Paper-VI(D) ENVIRONMENTAL BOTANY

### Section-A General

Introduction: Relation of man environment, National and international efforts on environmental problems Applied aspect of Environmental Botany

Ecosystem: Concepts and component classification, general idea of different ecosystems

Environment: Concept of environment, environmental segments, biosphere, atmosphere, edaphic environment. Biogeographical cycle

Environmental pollution:

a. General idea about pollution and pollutants

b. Water pollution: Physico-chemical properties of polluted water, heavy metal pollution, biological characterization of polluted water, water quality for drinking and quality of water of Indian rivers

c. Soil pollution: Degradation of soil, erosion, pollution (air borne sources, bioacides, solid wastes)

d. Air pollution: Ozone, sulphur dioxide, PAN and green house gasses, particulate pollutions and their impact on plants

e. Radioactive pollution: General idea about hazardous impact of radiations and radioactive fallouts

f. Noise pollution: General idea about various levels of noise pollution and human response.

### Section-A Environmental Management

Control of Environmental pollution: Environmental monitoring (Bioindicators)

Water Management of aquatic ecosystems and purification of water, sewage treatment

Soil: Soil conservation, solid waste and their disposal, waste collection, reclamation and cycling process

Air: Methods for monitoring air pollutants, air quality management and air pollution control devices, role of plants in air pollution abatement

Radioactive waste treatment

Noise abatement

Conservation of:

a. Forest: Forestation, Deforestation and social forestry

b. Endangered and threatened species

c. Renewable energy sources

d. Non-conventional energy sources

e. Population explosion and environment

f. Development of natural parks and biosphere reserves.

g, Reducing pollution by biotechnological methods, objectives and guarding principles of environmental education.

Environmental education and information: The environmental education in India.

Environmental Legislation: Control of environmental pollution through law, merits and demerits

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# M.Sc. BOTANY PRACTICAL EXAMINATION

## M.Sc. (Previous) Practical Examination (Botany)

The practical examination of M.Sc. Previous shall be completed in two days

- Day I - Based on Theory Paper I, II & III M.M. 120
- Day II - Based on Theory Paper IV & V M.M. 80

### Day I - Based on Theory Paper I, II & III Time-7:30 Hours M.M. 120

| | |
|---|---|
| Fungal material (at least two); preparation and identification | 16 |
| 1. Algal material (at least 3 from a mixture); preparation and identification | 15 |
| 2. Bryophyte (one); preparation and identification | 12 |
| 3. Pteridophyte (one); detailed study, preparation and identification | 12 |
| 4. Gymnosperm (one); detailed study, preparation and identification | 15 |
| 5. Experiment based on Bacteria | 06 |
| 6. Comment upon spots 1-8 | 24 |
| 7. Practical record, prepared slides and collection | 10 |
| 8. Viva-voce | 10 |

### Day II - Based on Theory Paper IV & V Time-5:30 Hours M.M. 80

| | |
|---|---|
| 1. Experiment on Ecology | 14 |
| 2. Experiment on Soil Science | 07 |
| 3. Stages of mitosis | 08 |
| 4. Stages of meiosis | 08 |
| 5. Problem based on Bio-statistics | 05 |
| 6. Emasculation | 05 |
| 7. Comment upon spots 1-6 | 18 |
| 8. Practical record, Collection etc. | 15 |

## M.Sc. (Final) Practical Examination (Botany)

There shall be two practical examinations in M.Sc. Final.

- First Practical (General - Based on Theory Paper I, II, III & V) M.M. 150
- Second Practical (Special - Based on Theory Paper V) M.M. 50

### FIRST PRACTICAL (General) Time - 9:00 Hours M.M. 150
### (Based on Theory Paper I, II, III & IV)

| | |
|---|---|
| 1. Description and taxonomic position of angiospermic plant | 10 |
| 2. Description and taxonomic position angiospermic flower | 08 |
| 3. Histological preparation of angospermic plant (stem or leaf) | 10 |
| 4. Embryology experiment | 07 |
| 5. Microbiology experiment | 10 |
| 6. Microtechnique experiment | 10 |
| 7. Plant Physiology experiment | 18 |
| 8. Biochemistry experiment | 15 |
| 9. Viva-voce | 10 |
| 10. Comment upon spots 1-10 | 30 |
| 11. Practical record, prepared slides and collection | 12 |
| 12. Herbarium | 10 |

## SECOND PRACTICAL (Special Paper) Time - 4 hours M.M. - 50
## (Based on theory Paper V)

**A- Special Paper – Plant Pathology Practical Time - 4 Hours M.M. 50**

| | | |
|---|---|---|
| 1. | Study of the host parasite relation of a pathogen | 12 |
| 2. | Preparation, description and identification of a pathogen | 10 |
| 3. | Preparation of culture medium or inoculation | 05 |
| 4. | Comment upon spots 1-5 | 10 |
| 5. | Viva-voce | 05 |
| 6. | Practical record and pathological collection | 08 |

**B- Special Paper – Plant Physiology Practical Time : 4 Hours M.M. 50**

| | | |
|---|---|---|
| 1. | Experiment on metabolism | 15 |
| 2. | Experiment on growth | 12 |
| 3. | Viva-voce | 05 |
| 4. | Comment upon spot 1-5 | 10 |
| 5. | Practical record | 08 |

**C- Special Paper – Forest Ecology Practical Time : 4 Hours M.M. 50**

| | | |
|---|---|---|
| 1. | Forest vegetation and analysis | 15 |
| 2. | Forest soil study | 12 |
| 3. | Comment upon spot 1-5 | 10 |
| 4. | Viva-voce | 05 |
| 5. | Practical record and Collections | 08 |

**D- Special Paper– Cytogenetics and Plant Breeding, Time:4 Hours M.M. 50**

| | | |
|---|---|---|
| 1. | Preparation of a fixative or a stain | 04 |
| 2. | Squash preparation for mitosis | 04 |
| 3. | Smear preparation for meiosis | 07 |
| 4. | Camera lucida drawing or preparation of tissue culture medium | 04 |
| 5. | Emasculation technique | 03 |
| 6. | Biostatistics, numerical problem and design | 05 |
| 7. | Viva-voce | 05 |
| 8. | Comment upon spot 1-5 | 10 |
| 9. | Practical record | 08 |

**E- Special Paper – Environmental Botany Time : 4 Hours M.M. 50**

| | | |
|---|---|---|
| 1. | Experiment on practical exercise No. 1 | 11 |
| 2. | Experiment on practical exercise No. 2 | 08 |
| 3. | Experiment on practical exercise No. 3 | 08 |
| 4. | Comment upon spot 1-5 | 10 |
| 5. | Viva-voce | 05 |
| 6. | Practical record | 08 |

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